

What is claimed is:

1. In combination with an acting element for exerting a predetermined action on a chemical solution, a chemical pump for pumping said chemical solution through said acting element, comprising:

a pressure chamber divided by a movable partition member into a first chamber and a second chamber; and

a single driving element for driving said partition member to reciprocate, thereby changing a volume ratio between said first chamber and said second chamber while the sum of the volumes of said first and second chambers is held constant,

wherein the chemical solution sucked and introduced into said first chamber by driving said partition member in a first direction is moved via said acting element provided outside said pressure chamber into said second chamber by driving said partition member in a second direction, and is then discharged out of said second chamber by driving said partition member in said first direction again.

2. The chemical pump according to claim 1, wherein

said single driving element drives said partition member by means of a driving force of a motor.

3. The chemical pump according to claim 1, wherein

said acting element is a filter element, and

said filter element is inserted in a pipe outside said pressure chamber for providing communication between said first chamber and said second chamber.

4. A piping system for directing a chemical solution through a pipe to a predetermined processing part, comprising:

a switching element for switching the operating mode of said piping system between a maintenance mode for purging air from said pipe and a normal mode for directing said chemical solution to said predetermined processing part; and

an opening and closing element for opening and closing said pipe in accordance with said operating mode switched by said switching element,

said pipe being connected to a chemical pump, said chemical pump being used in combination with an acting element for exerting a predetermined action on said chemical solution, said chemical pump pumping said chemical solution through said acting element,

said chemical pump including

a pressure chamber divided by a movable partition member into a first chamber and a second chamber, and

a single driving element for driving said partition member to reciprocate, thereby changing a volume ratio between said first chamber and said second chamber while the sum of the volumes of said first and second chambers is held constant,

wherein the chemical solution sucked and introduced into said first chamber by driving said partition member in a first direction is moved via said acting element provided outside said pressure chamber into said second chamber by driving said partition member in a second direction, and is then discharged out of said second chamber by driving said partition member in said first direction again.

5. A substrate processing unit comprising:

(a) a holding part for holding a substrate;

(b) a nozzle for discharging a chemical solution onto said substrate held by said holding part;

(c) a chemical solution reservoir for storing said chemical solution to be supplied to said nozzle;

5 (d) a chemical pump, used in combination with an acting element for exerting a predetermined action on said chemical solution, for pumping said chemical solution through said acting element, said chemical pump including

(d-1) a pressure chamber divided by a movable partition member into a first chamber and a second chamber, and

10 (d-2) a single driving element for driving said partition member to reciprocate, thereby changing a volume ratio between said first chamber and said second chamber while the sum of the volumes of said first and second chambers is held constant; and

(e) a piping system for directing said chemical solution through a pipe connected to said chemical pump to a predetermined processing part, said piping system  
15 including

(e-1) a switching element for switching the operating mode of said piping system between a maintenance mode for purging air from said pipe and a normal mode for directing said chemical solution to said predetermined processing part, and

(e-2) an opening and closing element for opening and closing said pipe in  
20 accordance with said operating mode switched by said switching element,

wherein the chemical solution sucked and introduced into said first chamber by driving said partition member in a first direction is moved via said acting element provided outside said pressure chamber into said second chamber by driving said partition member in a second direction, and is then discharged out of said second chamber by  
25 driving said partition member in said first direction again.

6. A substrate processing apparatus for performing a series of processes upon a substrate, comprising:

(a) a substrate processing unit including

5 (a-1) a holding part for holding a substrate,

(a-2) a nozzle for discharging a chemical solution onto said substrate held by said holding part,

(a-3) a chemical solution reservoir for storing said chemical solution to be supplied to said nozzle,

10 (a-4) a chemical pump, used in combination with an acting element for exerting a predetermined action on said chemical solution, for pumping said chemical solution through said acting element, said chemical pump including

(a-4-1) a pressure chamber divided by a movable partition member into a first chamber and a second chamber, and

15 (a-4-2) a single driving element for driving said partition member to reciprocate, thereby changing a volume ratio between said first chamber and said second chamber while the sum of the volumes of said first and second chambers is held constant, and

(a-5) a piping system for directing said chemical solution through a pipe connected to said chemical pump to a predetermined processing part, said piping system  
20 including

(a-5-1) a switching element for switching the operating mode of said piping system between a maintenance mode for purging air from said pipe and a normal mode for directing said chemical solution to said predetermined processing part, and

(a-5-2) an opening and closing element for opening and closing said pipe in  
25 accordance with said operating mode switched by said switching element;

(b) a development processing unit for performing a development process on said substrate;

(c) a heat treatment unit for performing heat treatment on said substrate; and

(d) a transport element for transporting said substrate between said units,

5        wherein the chemical solution sucked and introduced into said first chamber by driving said partition member in a first direction is moved via said acting element provided outside said pressure chamber into said second chamber by driving said partition member in a second direction, and is then discharged out of said second chamber by driving said partition member in said first direction again.

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7. A method of sucking and discharging a chemical solution, comprising the steps of:

driving in a first direction a movable partition member having opposite surfaces approximately equal in surface area within a pressure chamber divided by said partition member into a first chamber and a second chamber on opposite sides of said partition member, to increase the volume of said first chamber while decreasing the volume of said second chamber, thereby sucking and introducing said chemical solution into said first chamber;

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driving said partition member in a second direction within said pressure chamber to decrease the volume of said first chamber while increasing the volume of said second chamber, thereby moving said chemical solution from said first chamber to said second chamber via an acting element provided outside said pressure chamber for exerting a predetermined action on said chemical solution; and

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causing said partition member to increase the volume of said first chamber again while decreasing the volume of said second chamber again, thereby discharging

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said chemical solution out of said second chamber.

8. A method of directing a chemical solution through a pipe to a predetermined processing part, comprising the steps of:

5 (a) discharging said chemical solution to drive said chemical solution in a predetermined direction, said step (a) including the sub-steps of

(a-1) driving in a first direction a movable partition member having opposite surfaces approximately equal in surface area within a pressure chamber divided by said partition member into a first chamber and a second chamber on opposite sides of said  
10 partition member, to increase the volume of said first chamber while decreasing the volume of said second chamber, thereby sucking and introducing said chemical solution into said first chamber,

(a-2) driving said partition member in a second direction within said pressure chamber to decrease the volume of said first chamber while increasing the volume of said  
15 second chamber, thereby moving said chemical solution from said first chamber to said second chamber via an acting element provided outside said pressure chamber for exerting a predetermined action on said chemical solution, and

(a-3) causing said partition member to increase the volume of said first chamber again while decreasing the volume of said second chamber again, thereby discharging  
20 said chemical solution out of said second chamber; and

(b) directing said chemical solution driven in said step (a) through said pipe, said step (b) including the sub-steps of

(b-1) purging air from said pipe for maintenance,

(b-2) directing said chemical solution to said predetermined processing part,

25 (b-3) opening and closing a valve provided in a predetermined position of said

pipe, and

(b-4) switching between said sub-step (b-1) and said sub-step (b-2) by opening and closing said valve in said sub-step (b-3).

5           9. A method of supplying a chemical solution to a substrate to perform a predetermined process on said substrate, comprising the steps of:

(a) holding said substrate;

(b) discharging said chemical solution to drive said chemical solution in a predetermined direction, said step (b) including the sub-steps of

10           (b-1) driving in a first direction a movable partition member having opposite surfaces approximately equal in surface area within a pressure chamber divided by said partition member into a first chamber and a second chamber on opposite sides of said partition member, to increase the volume of said first chamber while decreasing the volume of said second chamber, thereby sucking and introducing said chemical solution  
15 into said first chamber,

(b-2) driving said partition member in a second direction within said pressure chamber to decrease the volume of said first chamber while increasing the volume of said second chamber, thereby moving said chemical solution from said first chamber to said second chamber via an acting element provided outside said pressure chamber for  
20 exerting a predetermined action on said chemical solution, and

(b-3) causing said partition member to increase the volume of said first chamber again while decreasing the volume of said second chamber again, thereby discharging said chemical solution out of said second chamber;

(c) directing said chemical solution driven in said step (b) through said pipe,  
25 said step (c) including the sub-steps of

(c-1) purging air from said pipe for maintenance,

(c-2) directing said chemical solution to said predetermined processing part,

(c-3) opening and closing a valve provided in a predetermined position of said pipe, and

5 (c-4) switching between said sub-step (c-1) and said sub-step (c-2) by opening and closing said valve in said sub-step (c-3); and

(d) discharging said chemical solution directed in said step (c) onto said substrate held in said step (a).